

**Comparison of Food (In)security between Non-assisted and NGO-assisted
Villagers in Kep and Kompong Trach, Kingdom of Cambodia**

Melissa Tan
Centre for International Health
University of Toronto, Canada

Table of Contents

Abstract	Page 3
Introduction	Page 4
Background	Page 5
Research Site	Page 7
Research Objectives	Page 7
Methods	Page 8
Design	Page 8
Sample and Setting	Page 9
Results and Discussion	Page 10
Household Demographics	Page 10
Participant Demographics	Page 11
Body Composition and Anthropometric Measurements	Page 13
Dietary Intake	Page 14
Food Accessibility	Page 18
Food Availability	Page 21
Food Utilization/Consumption	Page 21
Conclusion	Page 23
Acknowledgements	Page 26
References	Page 26

Introduction: Food security is defined as access to sufficient, safe and nutritious food to meet one's dietary needs for a productive and healthy life. In Cambodia, poverty, poor infrastructure and low educational attainment contribute to food *insecurity*, leading to chronic hunger, malnutrition and poor health outcomes. Furthermore, food insecurity is exacerbated by disease epidemics such as HIV/AIDS. **Objectives:** Household food security was assessed and contrasted between three populations: unassisted Kep villagers, unassisted HIV-infected Kep villagers, and non-governmental organization (NGO) assisted HIV-infected villagers in Kompong Trach in order to identify areas where food security could be improved. **Results:** High illiteracy (70%), low income (\$10 USD/month) and large households (5 people/house) provide a setting for food insecurity. Indeed, all households reported insufficient food 3 days/week and insufficient money for food 5 days/week. Dietary assessment revealed widespread micronutrient deficiencies within the unassisted HIV sample which consumed no dairy or fruit and little iodized salt. NGO-assisted villagers consumed the most balanced diets, with the most participants consuming three daily meals (53%). Self-provisioned rice stores were the highest within healthy Kep villagers (7 months). NGO-assisted villagers had the second longest self-sustaining rice store at 4 months, and unassisted HIV-infected Kep villagers had no rice stores; HIV/AIDS morbidity and lack of land access thus limited the capability to grow rice. In the face of financial constraints, unassisted households chose indebtedness over hunger, while the opposite was observed in NGO-assisted households. **Conclusion:** Chronic food insecurity was observed in all households, but it was most significant in unassisted HIV-affected households. Unassisted 'healthy' households showed better food security, but high levels of indebtedness hinder *long-term* food security. On the basis of multiple indicators including diet, number of daily meals and food stores, NGO-assisted households showed the greatest levels of food security despite a lesser ability of self-provisioning.

Introduction

Food security is when all people at all times have both physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for a productive and healthy life^{1,2,3}. To attain food security, the three variables of food availability, food accessibility and proper food utilization/consumption must be met³. In many developing countries such as Cambodia, local and national issues such as poverty, disease epidemics, poor infrastructure and low levels of education contribute to a state of food *insecurity*, leading to chronic hunger, malnutrition and poor health outcomes. The Cambodia Ministry of Health (MoH) realizes the importance of food security on health by identifying it as one of three main priorities within the Cambodian MoH National Primary Health Plan, alongside HIV/AIDS prevention/treatment and maternal and child health.

Since 2002, the Centre for International Health (CIH) at the University of Toronto has worked with the National Centre for Health Promotion (NCHP) and the Operational District Director of Health (OD) of the Kep municipality to provide demand driven research, service and education towards the goal of developing a sustainable primary health care system⁴. The CIH is also in partnership with a local NGO, Cambodia Development and Relief Centre for the Poor (CDRCP), whose primary mission is to alleviate poverty and improve living conditions among vulnerable populations infected, affected or orphaned by HIV/AIDS. This project was conducted to assess food security within the Kep Operational District as well as vulnerable populations assisted by the CDRCP and furthermore, to determine if differences in food security existed between the two groups. The baseline data obtained from this project will help identify areas where food security could be improved such that better health outcomes can be achieved.

Background

Cambodia is an agricultural country with over 70% of the population engaged in agricultural production, the majority of which consists of the rural poor². Central to achieving food security in Cambodia is a steady and sufficient quantity of rice, as rice alone accounts for almost 70% of the average caloric intake². Although the country produces sufficient rice on a national level, many areas still face chronic rice shortages. In fact, having sufficient rice and other foodstuffs for 12 months of the year equates to not being food insecure. This is especially true for the rural poor as well as vulnerable populations including people living with HIV/AIDS (PLWHA), widows, and orphaned and vulnerable children (OVC).

Cambodia faces challenges in all three areas of food security: availability, accessibility and utilization/consumption. Agricultural production is the main determinant of food availability. In Cambodia, the former limits the latter through limited irrigation, small land holdings and low productivity². Secondly, food accessibility requires that individuals have adequate incomes or other resources to acquire food necessary for an adequate diet³. Widespread poverty in Cambodia makes it difficult for many rural and vulnerable households to obtain enough food to supplement household production to meet the WHO's guidelines of 2100 daily calories⁵. Specifically, the poor often have low purchasing power, high debt and a lack of access to adequate credit, compounded by limited off-farm employment opportunities². Lastly, food utilization and consumption requires proper processing and storing techniques alongside knowledge of nutrition and sanitation, all supported by adequate health services³. The high reliance upon rice as a dietary staple contributes to micronutrient deficiencies while low levels of education regarding sanitation, and nutrition in the face of high disease and inadequate public health care limits food utilization and consumption in Cambodia.

Vulnerable populations such as PLWHA often deal with the double burdens of disease and poverty. In many instances, the sick in rural Cambodia will first utilize small household resources to fund high medical expenses, eventually resorting to selling off assets such as farmland and livestock, which further deepens the slide into food insecurity. People infected, affected or orphaned by HIV/AIDS are thus unable to financially support themselves, leading to greater marginalization and food insecurity as they are forced to live on the street, and/or resort to the sex trade or other menial work for survival. The homeless, sex workers and other marginalized populations have been linked to poor health outcomes and higher HIV infection rates, all of which fuel subsequent cycles of food insecurity⁶.

Of all Southeast Asian nations, Cambodia has one of the highest HIV prevalence rates at 2.6% in 2003⁷. Heterosexual transmission is the most common mode of infection in Cambodia, where husbands infected after visiting female sex workers return home to infect their wives. Widespread public education campaigns have helped to control the epidemic and to decrease the marginalization of PLWHA's. An NGO who has had great success in gaining greater public acceptance of HIV/AIDS through its village education programs is the CDRCP.

CDRCP targets orphans, widows, disabled and elderly people and aims to promote the health and social welfare of these vulnerable people, with the majority of their programming presently targeting HIV/AIDS. With a head office in Phnom Penh and provincial offices in the Kampot and Oddar Meanchey Provinces, CDRCP provides home-based care to PLWHA, widows and OVC's. The food security of this vulnerable population is bolstered by monthly World Food Program donations of rice, oil and iodized salt. Additionally, CDRCP provides academic scholarships for OVC's and referrals for medical care to United Nations sponsored anti-retroviral programs. Recently, PLWHA's have been given vegetable seeds for home gardens

as part of an income-generating and diet supplementation effort. On a community level, CDRCP holds education sessions to promote awareness and acceptance of HIV/AIDS and other sexually transmitted infections.

Research Site

Kampot province in southwestern Cambodia contains eight districts with a total population of 528, 405⁸. CDRCP is based in the Kompong Trach district, which contains 14 communes (administrative regions) subdivided into 39 villages. Adjacent to and 15 kilometres south west of Kompong Trach is Kep. Kep, where the CIH is based, is a self-governing municipality and province on the Gulf of Thailand. This operational district consists of 6 communes further divided into 18 villages with a total population of 28, 677⁹.

Research Objectives

While food security is one of three priorities for the Cambodian government, most reports focus on the national scope of this issue. This project will be the first to examine food security not only at the village level but also the first to examine food security within a vulnerable HIV/AIDS population at the village level. The purpose of this study was to assess and contrast the status of food security among non-assisted villagers in the Kep Operational District (including 6 HIV-infected households) with NGO-assisted villagers infected or affected by HIV/AIDS in the Kompong Trach District. The findings of this study will be used by: (a) the Kep Operational District to plan educational and infrastructural interventions for their villagers, (b) the CDRCP to evaluate the effectiveness of current programs and to isolate targets for future programming, and (c) the Ministry of Health in their planning for home-based care for people living with HIV/AIDS¹⁰. Additionally, the baseline information gathered from this study may be

used in future studies conducted by the Centre of International Health to determine the progress achieved in combating food insecurity through initiatives implemented by the Ministry of Health, Kingdom of Cambodia.

Methods

Design

This study was conducted in June and July 2005 through a 112-item structured and open-ended questionnaire, comprising of: 16 demographic items, 3 physical signs and anthropometric measurements, 49 dietary recall items, 17 food accessibility items, 15 food availability items, 10 food utilization items and 2 participant perspective items. In addition to identifying data and socioeconomic indicators, HIV status and risk factor history was also ascertained in the participant demographics. Physical signs and anthropometric measurements of height, weight and mean upper arm circumference (MUAC) were measured with a cloth tape measure and bathroom weight scale. MUAC for this study was taken from halfway between the acromion and the olecranon. Body mass index was calculated from height and weight measurements through the following formula: Weight in kilograms/(height)² in meters¹¹.

This study did not focus on quantifying the amounts of various foodstuffs participants consumed; rather, questions were directed towards *relative* amounts and seasonal variation of different foods between the wet and dry season. Wet and dry seasons were used for comparison because two distinct lifestyles can be observed in rural Cambodia: high calorie expenditure for subsistence farming during the wet season, and lower calorie expenditure during the dry season. Food accessibility questions addressed the number and timing of meals along with sources of food and methods of food acquisition. A lack of food and money for food was assessed quantitatively through directed questioning about the frequency of these scenarios. Food

availability questions focused on fertilizer use as an indirect means to gauge agricultural production and thus food availability. Food utilization questions concentrated on household stores of various dried and fresh foodstuffs as well as the stability, availability and barriers to access of fuel sources necessary to proper food preparation. A survey of the knowledge, attitudes and practices of nutrition and the effects of health and sanitation services as they pertain to food security would ideally be included in this section, but it was beyond the scope of this project to do so. Two open-ended questions ended the questionnaire, asking participants to reflect and propose solutions their food insecurity.

In addition to the 112-item questionnaire, a follow-up questionnaire administered to CDRCF patient participants to ascertain the known length of their infection as well as the sources of aid they receive from the NGO. This allowed greater appreciation of their food security and enabled better comparisons between the two populations.

Sample and Setting

The study sample consists of three distinct populations, one drawn from unassisted villages in the Kep Operational District (Kep sample), the second from 6 unassisted HIV-positive households in the Cham Kabey village within the Okrasa commune of Kep (Kep-HIV sample) and the third from NGO-assisted vulnerable populations in the Kompong Trach district (NGO sample). A total of 223 households were surveyed across all three populations. The Kep sample consisted of 172 households recruited by convenience sampling in three communes and eight villages, including the 6 unassisted HIV households (Table 1). A further 51 households comprising of the NGO sample was drawn from CDRCF's HIV/AIDS patient database spread across 8 communes and 28 villages. Unless specified, the Kep-HIV sample was analyzed as part of the Kep sample.

In all cases, a local translator accompanied the researcher and ensured that confidentiality and oral consent were obtained from all surveyed participants. In the NGO sample, CDRCP staff accompanied the researcher and the translator team from household to household. The inclusion criteria for all households was adult men or women, aged 18 years or over who helped provide food or income for their families, spoke fluent Khmer, and were present at the house at the time of sampling. For the NGO subset, participants must additionally be one of: (a) adult men or women aged 18 years or over currently living with HIV/AIDS or (b) spouses or widows of infected adults or (c) HIV-positive orphans under 18 years or (d) non-infected orphans of HIV-positive parents.

Table 1. Distribution of surveyed participants in the Kep Operational District		
Commune	Village	Households
Angkaul	Angkaul	20
	Aom Peng	20
	Koh Soam	26
	Toul Sangam	20
Okresa	Okresa	20
Prey Takoy	Cham Kabey	26 (6 HIV infected)
	Ou Doung	20
	Prey Takoy	20

Results and Discussion

Household Demographics

Of the 223 participants interviewed, 150 were female and 73 were male. Because surveys were performed during work and farm hours, the surveyed population reflects traditional societal gender roles where males farmed in the fields while women had more domestic duties. Household size ranged from 2 to 12 persons, with an average of 5.6 persons in each household. 221 or 99% of households reported having children, ranging from 1-11 children per household

with an average of 4.2 children per household, but higher rates of one-parent households were reported in the NGO sample (55%) relative to the Kep sample (11%). Higher rates of one-parent households predisposes these households to greater food insecurity as there are fewer adults of working age to farm and generate income to buy food¹².

Participant Demographics

Mean age of all participants was 39.2 ± 13.4 years, ranging from 6 to 83 years. Most (89%) were between 18-59 years old. A comparison of marital status reveals a significantly higher proportion of widows in the NGO sample relative to the Kep sample (Fig. 1), with the majority of these widowers being HIV-positive females (75%). This finding matches the reported heterosexual transmission route from infected husbands to wives, with husbands dying first and leaving behind infected widows and children.

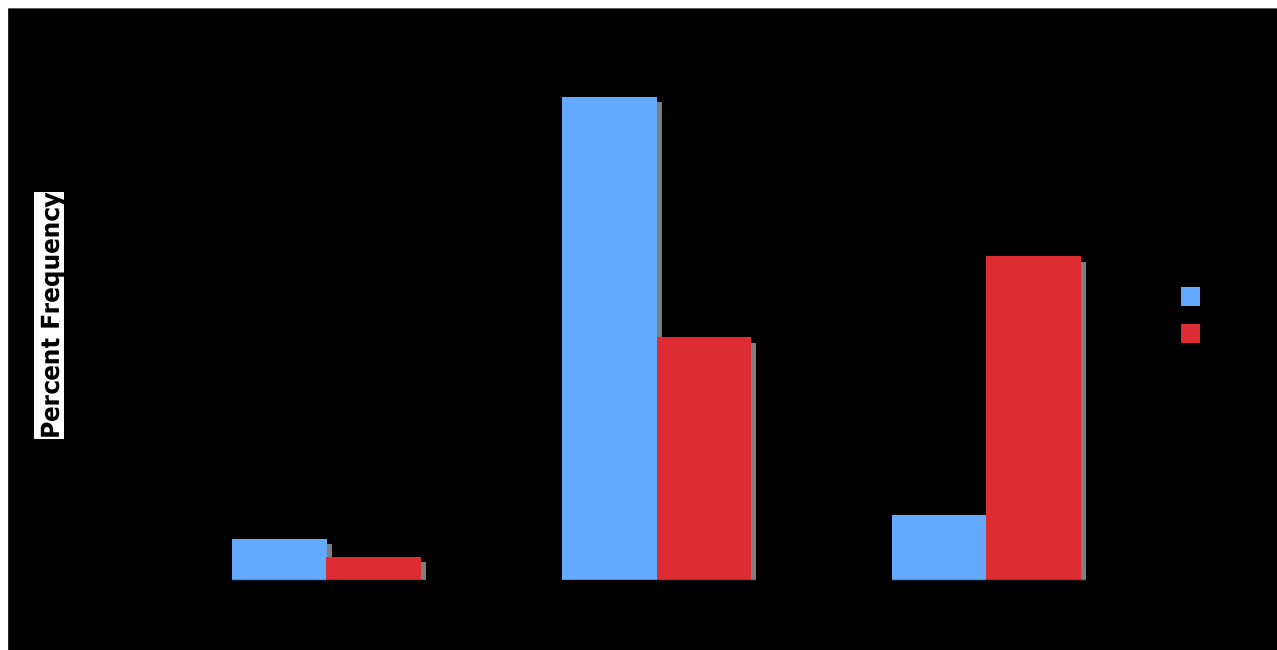


Figure 1. Marital status of Kep and CDRCP samples.

Most of the participants had low educational attainment (Table 2). Illiteracy rates were

higher in the Kep sample (72%) relative to the NGO sample (62%), matched by a lower rate of primary education completion in the Kep sample (29% to 38%, respectively). Furthermore, the lower level of educational achievement in the Kep sample corresponded to a higher proportion of females in the sample population, reflecting the societal inequality in education that grants men priority in school attendance¹⁰. Adult illiteracy rate is a socio-cultural indicator that predisposes to food insecurity¹⁶, suggesting that a higher proportion of unassisted villagers in Kep may be food insecure.

Table 2. Educational Attainment Relative to the Proportion of Females in the Sample				
Sample	Female <i>n</i> (%)	Illiterate <i>n</i> (%)	No education <i>n</i> (%)	Primary education <i>n</i> (%)
Kep	117 (68)	123 (72)	70 (41)	49 (29)
NGO	33 (65)	33 (62)	21 (42)	19 (38)

The majority of surveyed participants relied solely upon subsistence farming and did not generate any income through other means (Table 3). This finding is echoed in the reported monthly mean incomes of surveyed participants, which was significantly higher in Kep (\$12 USD/month) in comparison to the NGO sample (\$5 USD/month). A lower reported monthly income also corresponded to the higher proportion of participants in the NGO sample (63% NGO vs 49% Kep) who did not engage in any income generating activities. Of all surveyed participants who did make an income, the majority were self-employed street vendors with smaller proportions working as a paid labourer, salaried employee or shopkeepers. Other non-specified income generating activities included: motorcycle driver, roof thatcher, bicycle repairman and land steward.

Table 3. Income Generating Activities of Participants						
Sample	None	Paid labour	Street vendor	Shopkeeper	Salaried worker	Other

	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
Kep	85 (49)	12 (7)	56 (33)	2 (1)	7 (4)	15 (6)
NGO	32 (63)	4 (8)	8 (16)	0 (0)	1 (2)	7 (10)

Body Composition and Anthropometric Measurements

The mean height, weight, and body mass index was equivalent for surveyed males and females in both samples at 1.53m, 53 kg, and 22 kg/m², respectively. Although a mean BMI of 22 kg/m² is above the 18.5 kg/m² cut-off for thinness¹³, these results should be interpreted with caution, as the Cambodian Demographic and Health Survey¹⁴ would consider 29% of the surveyed female population at nutritional risk with a height less than 1.5 m, despite a *mean* female height of 1.53 m. Unfortunately, no equivalent information was available for adult males for comparison. A better measurement of undernutrition may instead be the MUAC, which has been found to correlate closely with BMI while better predicting poor outcome¹⁵. At a mean MUAC of 24 cm, this would be considered ‘thin’, defined as an MUAC of between 23.5 and 25 cm¹⁵. Other than indicating that all populations were on the thin side, BMI and MUAC measurements were inconclusive in determining differences in food security between the various sample populations.

Dietary Intake

Rice consumption was closely monitored, with all participants readily providing clear and specific answers when asked. An average of 540 g of uncooked rice was consumed daily, with increased consumption of 140 g in the wet season being reported in the majority of the surveyed population (Table 4). Protein and vegetable consumption was the next closely monitored food category in all three samples with approximately 50% participants indicating increased wet season consumption. The sole exception to this is within the unassisted Kep-HIV

sample, where only 1 respondent indicated increased wet season consumption. When surveyed, the Kep-HIV population reported consuming an average of 340 g of protein daily, which is double the average daily consumption of 170 g within the Kep and NGO samples. Because protein is the most expensive energy source, the Kep-HIV population may already be spending a larger proportion of their food budget on protein, and lack the financial resources to increase protein consumption as much as the other two samples. Indeed, the Kep-HIV population was aware of the importance of protein in maintaining their health, but indicated that they would re-allocated some of their resources towards acquiring rice over protein in the face of severe financial constraints, despite being aware of the potential for micronutrient deficiencies. This behavior could explain why there is a higher proportion of the Kep-HIV sample reporting wet season increases (83%) relative to the Kep and NGO samples.

The last three food categories of fruit, dairy and high calorie foods showed no comparable trends within the three populations (Table 4). Quantifiable amounts of consumed fruit, milk and various desserts and snacks was difficult to assess as there was large variability and imprecision in estimating portion weights. Within the Kep sample, high calorie food and fruits had relatively similar rates of increased consumption at 19% and 17% respectively, with dairy consumption showing the least increase in reported wet season consumption at 10%. In contrast, the NGO population showed very similar trends with approximately 10% of this sample reporting increased wet season consumption within all three food categories. Lastly, the Kep-HIV sample showed a distinct lack of dairy and fruit consumption (indicated by the lack of wet season consumption change) accompanied by a much higher proportion of participants reporting increased high calorie foods consumption when compared to the other two samples.

Table 4. Proportion of participants reporting increased consumption during the wet season.	
Food category	Sample

	Kep <i>n</i> (%)	Kep-HIV <i>n</i> (%)	NGO <i>n</i> (%)
Rice	116 (70)	4 (83)	32 (63)
Protein	81 (49)	1 (17)	26 (51)
Vegetables	80 (48)	3 (50)	24 (47)
Fruits	28 (17)	0 (0)	4 (8)
Dairy	17 (10)	0 (0)	5 (10)
High calorie	32 (19)	2 (33)	5 (10)

The proportion of individuals indicating increased consumption during the wet season was used to define the relative importance of each food category when faced with resource constraints in the face of food security. If this system is used, three distinct patterns emerge from the three various samples. Within the unassisted Kep sample, grouping the proportion of increased wet season consumption reveals a four-point priority list with participants choosing to allocate limited agricultural and financial resources towards acquiring rice first and dairy products last (Table 5). A similar pattern was observed in the assisted NGO population, but the lower proportion of wet season increase across the majority of the categories suggests that a greater proportion of NGO participants may be at increased food insecurity as financial constraints limit food acquisition in times of need such as farming. When compared to the *unassisted* vulnerable Kep-HIV sample, the NGO sample revealed more balanced diets indicating a better degree of food security.

Table 5. Relative Importance of Various Food Categories with Resource Constraints

	Sample	
Kep	Kep-HIV	NGO

First priority	Rice	Rice	Rice
Second Priority	Protein Vegetables	Vegetables	Protein Vegetables
Third Priority	High calorie foods Fruits	High calorie foods	High calorie foods Fruits Dairy
Fourth Priority	Dairy	Protein	
Fifth Priority		Dairy Fruits	

A comparison of iodized salt consumption within the three populations also showed significantly different trends (Fig. 2). There is low use of iodized salt within unassisted Kep villagers with higher use within the Kep-HIV population. The latter appeared to take more care with nutrition in the hopes for better long-term outcomes, and thus were more willing to make use of more expensive iodized salt. Consumption of iodized salt within the NGO sample was significantly higher at close to 90% due to the World Food Program monthly food aid assistance containing iodized salt. Those who did not consume iodized salt within the NGO population were not yet enrolled with the World Food Program, emphasizing the importance of food aid in attaining not only food security, but also better health outcomes for vulnerable populations. From these values, iodized salt appears to be a very low priority for all participants, with higher rates in the NGO population being attributable directly to NGO assistance. Furthermore, the percentage of households consuming iodized salt is an indicator of food security¹⁶. As such, NGO assisted households would appear to have better food security.

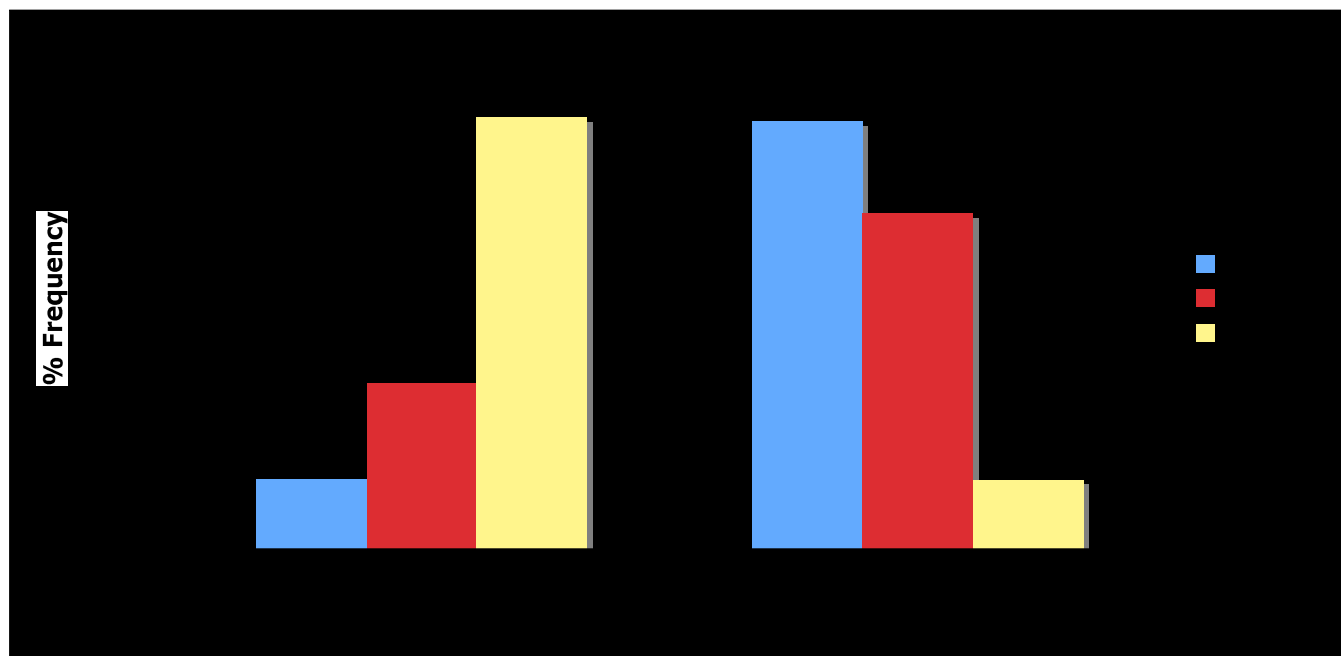


Figure 2. Consumption Frequency of Iodized Salt

In summary, NGO assistance encourages better nutrition (a determinant of food security) through food aid; food aid is especially useful for directly or indirectly promoting health outcomes in areas of micronutrient deficiencies in vulnerable HIV/AIDS populations. Direct micronutrient assistance such as iodized salt supplementation ensures better nutrition, which is also a lifestyle cofactor for HIV/AIDS, allowing PLWHA's (and their families) to benefit from better health. NGO sponsored food aid also provides adequate amounts of cereals, freeing up financial resources and indirectly allowing individuals to consume a more balanced diet. This is illustrated by the ability of villagers in the NGO sample to redirect household resources towards fruit and dairy in comparison to the absence of dairy and fruit consumption by the unassisted HIV population in Kep. A crude dietary assessment thus reveals that NGO assisted populations in Kompong Trach have obtained better food security relative to their unassisted counterparts in Kep.

Food accessibility

Eating patterns within the three surveyed samples revealed that fewer unassisted Kep villagers ate 3 daily meals relative to the other two groups (Table 6). Using the number of daily meals as an indicator of overall feeding practices and therefore food security¹⁶, unassisted Kep villagers show less food security. Even though a larger proportion of the Kep sample consume daily snacks, these snacks are mainly high calorie low nutrient foods that may help in the interim, but is not contributing long-term food security, and is instead creating a setting for micronutrient deficiency.

Table 6. Participants' Eating Patterns

	Kep <i>n</i> (%)	Sample Kep-HIV <i>n</i> (%)	NGO <i>n</i> (%)
Meals			
2 daily meals	136 (82)	0	24 (47)
3 daily meals	30 (18)	100 (100)	27 (53)
Snacks			
No snacks	99 (60)	100 (100)	38 (75)
≥1 daily snack	66 (40)	0	13 (25)

In rural Cambodia, subsistence farming is the primary method for villagers to acquire food. To this end, 83% of unassisted Kep villagers and 70% of NGO assisted Kompong Trach villagers grow their own food. None of the HIV infected individuals in Kep farmed as they possessed no land to do so. Of those who farmed, the majority of the Kep and NGO samples (78 and 67%, respectively) indicated that the food they grew was insufficient for their household needs. Further questioning revealed that unassisted Kep households contained an average of 7 months' *self-provisioned* rice stores while NGO-assisted households reported an average of 4 months' rice stores. HIV-affected households in Kep did not possess any reportable rice stores.

The ability to self-provision rice indicates food stability and access, two major determinants of food security¹⁶. A comparison of the three sample populations on the basis of the capacity to self-provision rice therefore reveals that unassisted Kep villagers would have the best food security as they are best able to meet household food needs through self-provisioning, with lesser ability in the Kompong Trach NGO villagers. Kep villagers infected with HIV were unable to self-provision their households in any major way and thus would have the worst food security of the three groups.

All surveyed participants indicated that their households ran out of food an average of three times a week. When food stores run low, almost all households (92% across all three samples) would eat less, with parents in 8% of these households choosing to go hungry, giving their food portion to their children instead. Furthermore, all surveyed individuals reported that they had insufficient money to buy enough food for their households an average of 5 days a week.

When facing financial constraints, Kep villagers would choose indebtedness over hunger (Table 7). In contrast, NGO assisted villagers would choose to go hungry, feeling that they already owe a debt to the World Food Program. Furthermore, they do not wish to put their households into deeper debt as the poor health outcomes of HIV/AIDS renders them incapable of repaying the loan in the future. Because of the limited employment opportunities available, villagers often cannot work even if they wish to, and equally cash-strapped neighbors may not have money to lend, which may account for the low proportion of the sample population who would choose to work or borrow money from neighbors.

Table 7. Food Acquiring Behaviors When Financially Constrained

Behavior	Kep <i>n</i> (%)	Sample Kep-HIV <i>n</i> (%)	NGO <i>n</i> (%)
Owe market vendor	87 (51)	0	11 (22)
Don't purchase	25 (15)	2 (33)	22 (43)
Work	28 (16)	2 (33)	7 (14)
Borrow money	17 (10)	0	8 (16)
Sell animal	9 (5)	0	2 (4)
Scavenge	3 (2)	0	0 (0)
Other	15 (9)	0	8 (16)

NGO assisted HIV-infected villagers therefore appear to possess a greater degree of food security as a larger proportion of the sample group consumed 3 daily meals, followed by the *unassisted* HIV infected villagers and lastly by Kep villagers. This changed when self-provisioned rice stores were compared, with Kep villagers being the most capable of self-provisioning their households, followed by the NGO assisted HIV-infected villagers and lastly by the HIV infected Kep villagers. All populations reported similar frequencies of inadequate food stores and financial constraints for adequate food. Food acquisition behaviors differed by population however, with vulnerable assisted and unassisted HIV populations choosing hunger over indebtedness; this trend is opposite what was reported by Kep villagers.

Food Availability

Agricultural productivity is the most important indicator of sufficient food availability, but this was difficult to determine directly. Instead, questions about fertilizer use were asked to assess the yields per hectare for rice¹⁶. 93% of both the unassisted and NGO-assisted sample populations who self-provisioned food for their household reported using fertilizer to increase crop yields (unassisted HIV Kep villagers did not farm). Only 2% within both samples felt that they had enough fertilizer for their needs; furthermore, none of the participants felt their

household had sufficient money to meet their fertilizer needs. These findings suggest that fertilizer is of lower priority relative to food in all surveyed populations when faced with financial resource limitations. Therefore, unless short-term food security, perhaps in the form of greater food aid, can be attained, agricultural productivity will continue to be hindered, thus limiting the ability of all villagers to attain long-term food security.

Food Utilization/Consumption

Proper food processing and storage techniques are necessary to achieving food security and maintaining good health³. The only significant foodstuff households stored was rice, where 92% of unassisted Kep households possessed any rice stores and 63% of NGO assisted household reporting the same. None of the HIV infected households in Kep possessed any rice stores. Clearly, food aid is bolstering household food security in vulnerable populations as evidenced by the higher numbers of assisted HIV-affected households possessing rice stores central to achieving food security in Cambodia².

Food storage techniques were not hindering food security because all households reported cooking and consuming food only hours after purchase, buying only what was necessary for each day's use. This day-to-day purchasing pattern rendered the need for an icebox rather useless. Indeed, none of the unassisted HIV-infected participants had household rice stores of any foodstuffs and none required an icebox as their food was so quickly consumed. Rice was carefully stored (from most to least common): in sacks, in a cage, or in lidded canisters.

To properly process food, a source of fuel is required to ensure that micro-organisms are killed before ingestion, thus preventing poor health. All households used firewood with only 4% of the surveyed households used coal or gas in addition to firewood. Additionally, all households also reported lacking not only enough cooking fuel, but also the funds necessary to purchase fuel

to meet their household needs when supplies ran low. Almost all households (>90% of total) scavenged for firewood; surveyed households tended to scavenge either very close (<1 km) or travel quite far (>5 km) to acquire firewood (Table 8). Traveling to more distant sources of firewood was preferred because nearby sources are often exhausted. The task of acquiring firewood at a distance usually fell on either the father or sons in the household. It is therefore not surprising to see that HIV-affected households, NGO-assisted or not, tend to scavenge closer to home because of a higher proportion of single-women led households. Fatigue imposed by HIV/AIDS may also prevent HIV-infected villagers in Kep and Kompong Trach from traveling far.

Table 8. Distance Travelled to Acquire Firewood			
	Kep <i>n</i> (%)	Sample Kep-HIV <i>n</i> (%)	NGO <i>n</i> (%)
< 1 km	51 (31)	6 (100)	30 (59)
1-5 km	27 (16)	0	3 (6)
> 5 km	92 (55)	0	17 (33)

Participant Perspectives

When asked if they would wish for more food, all participants said yes, but when asked for input on ways household food security could be improved, many participants could not answer or volunteered tangible, if more short-term solutions of wanting more rice and money (Table 9). This was especially true in the NGO and Kep-HIV sample, where HIV-infected participants fatigue more easily and therefore cannot farm as easily as the ‘healthy’ villagers. Few villagers volunteered solutions that would increase agricultural production that would result in greater food availability. Even fewer villagers were aware of the importance of clean water on

food security. These results suggest that short-term food security is still of utmost priority, and only when this is achieved can long-term food security start to gain importance.

Table 9. Participants' Suggestions for Improvement

	Kep <i>n</i> (%)	Sample Kep-HIV <i>n</i> (%)	NGO <i>n</i> (%)
Direct aid			
Rice aid	49 (30)	6 (100)	41 (80)
Money aid	25 (15)	6 (100)	29 (57)
Food availability indicators			
Increase fertilizer use	13 (8)	0	3 (6)
Greater land holdings	12 (7)	0	2 (4)
Better rice seed	2 (1)	0	0
Better market price for rice	2 (1)	0	0
Irrigation	1 (1)	0	0
Food utilization/consumption indicators			
Clean water	7 (4)	0	6 (12)
Agriculture education*	2 (1)	0	0

*indicates education about farming methods to increase yields and efficiency

Conclusion

Attaining food security is a long term process requiring that the country in question commit to broad-based, equitable social and economic policies that will improve multiple variables of food security and engender sustained economic growth². Villagers in Cambodia are more concerned with short-term food security presently, and education will help in making them aware of the variety of indicators that impact on food security, ranging from sanitation to agricultural practices to nutrition to school enrolment. Chronic food insecurity was observed in all households, but it was most significant in unassisted HIV-affected households where widespread micronutrient deficiencies caused by a complete lack of fruit and dairy consumption

combined with a lack of land access hindering self-provisioning capabilities paints a harsh picture of meagre day-to-day subsistence. Unassisted 'healthy' households showed better food security, but low iodized salt consumption, high levels of indebtedness and fewer people consuming three daily meals hinder *long-term* food security. On the basis of multiple indicators, NGO-assisted HIV-affected households showed the greatest levels of food security (despite a lesser ability of self-provisioning) with the lowest illiteracy rates, most balanced macro- and micro- nutrient diet and highest proportion of the population consuming three daily meals.

To address these conclusions, various initiatives may be implemented to help improve food security in all Kep and Kompong Trach villagers. Since rice security is central to food security, hybrid rice seed could be introduced to improve rice yield. These hybrid varieties would have greater virus and insect resistance while requiring less fertilizer and a shorter growing time in order to achieve the same yield per hectare. Secondly, the success of microcredit programs have been extensively studied and their importance recently recognized through the UN's Year of Microcredit 2005. Microcredit schemes have been shown to empower microcredit loan clients and help lift them out of poverty. Such a program could easily be put into operation in the Kep District; CDRCP has in fact been starting a microcredit scheme to much success. The benefits of a microcredit program would spread beyond local market economies and strengthen not only regional markets but ultimately the national economy. Lastly, a homestead gardening program could be introduced similar to one studied in Bangladesh¹⁷. Although it would benefit all participants, this program would be especially beneficial to women who have less of an opportunity to work off the household farm and empower them while allowing them to contribute to the household finances in a more significant manner. The ability to generate income close to home would be extremely desirable to the HIV-positive women CDRCP helps

by allowing them to care for their families while being able to better their nutrition and earn greater amounts of money to direct towards either health care or a more nutritious and diverse diet.

Although a relatively large sample size was obtained for this study, the convenience sampling methodology for this study may have introduced bias in that a greater proportion of the study sample came from households close to the roads. Due to their proximity to roads and markets, these households may have reported slightly greater diversity of diet and/or better diet through closer access to credit. The use of translators for this project and the verbal delivery method also introduced an element of subjectivity through translation from Khmer to English. This was compounded by the villagers' relative lack of education, making it difficult to communicate some of the concepts asked of them in the survey. In response to this, there often was discussion and input from other villagers during the delivery of the survey; the results thus may have been coloured by a communal thought pattern instead of the autonomous replies. However, there was no way to discourage these actions without impinging on the goodwill and hospitality study participants had already extended through their agreement to participate in this research project.

It is hoped that the results of this report will motivate and help guide future research projects in the area of food security in the Kep Field Station and contribute to the cross-cultural learning and teaching between the University of Toronto Centre of International Health and the Kep Health District. Through the combined efforts of the local community and the actions of this partnership, greater food security can be achieved for all Kep villagers regardless of their HIV status.

Acknowledgements

I would like to thank the Centre for International Health and the University of Toronto Medical Alumni Association for providing this invaluable learning and research opportunity. Additionally, I would like to acknowledge the support and guidance of the local Cambodian staff Mr. Thom Bunthoeun and Mr. Rath as well as my fellow student colleagues without whose unwavering support this project would not have been completed. Lastly, I would like to thank the Kep Operational District for welcoming me with such gracious hospitality during my stay in Cambodia.

References

1. United Nations. (1975). *Report of the world food conference, Rome*. New York: New York.
2. Royal Government of Cambodia. (2002). *National Poverty Reduction Strategy 2003-2005*. Phnom Penh: Cambodia.
3. US Agency for International Development (USAID). (1992). *Policy determination: definition of food security*. USAID 1992: Washington, DC.
4. Centre for International Health. (2004). *2004 Retrospective*. Toronto: Canada.
5. World Health Organization. (1985). *Energy and protein requirements. Report of a joint FAO/WHO/UN Expert Consultation*. Geneva: Switzerland.
6. World Health Organization. (2003). *Nutrient Requirements for People Living with HIV/AIDS*. Geneva: Switzerland.
7. Joint United Nations Program on HIV/AIDS. (2004). *2004 report on the global HIV/AIDS epidemic : 4th global report*. Geneva: Switzerland.
8. National Institute of Statistics. (1998). *1998 Population Census of*

Cambodia. Retrieved

October 9, 2005 from the World Wide Web:

<http://www.nis.gov.kh/CENSUSES/Census1998/statistics.htm>.

9. Okrasa Commune District Office. 2003 Statistics.

10. National Centre for HIV/AIDs, Dermatology, and Sexually Transmitted Disease. (2003).

Continuum of Care for People Living with HIV/AIDS: Operational Framework – 1st Edition.

Ministry of Health: Cambodia.

11. World Health Organization. (1995). *Physical status: The use and interpretation of*

Anthropometry. Technical Reports Series, 854. Geneva: Switzerland.

12. Nord M, Andrews M and Carlson S. (2001). *Household food security in the United States*.

United States Department of Agriculture: Washington, DC.

13. James W, Francois P J. (1994). The choice of cut-off point for distinguishing normal body weights from underweight or “chronic energy deficiency” in adults. *Eur J Clin Nutr*. 48(suppl 3): S179–S184.

14. National Institute of Statistics. (2001). *Cambodia Demographic and Health Survey 2000*.

National Institute of Statistics: Phnom Penh, Cambodia.

15. Powell-Tuck J, Hennessy E M. A comparison of mid upper arm circumference, body mass

index and weight loss as indices of undernutrition in acutely hospitalized patients. *Clin Nutr*. 22(3): 307-312.

16. Committee on World Food Security. (2000). *Suggested Core Indicators for Monitoring Food Security Status*. Food and Agriculture Organization of the United Nations: Geneva, Switzerland.

17. Bushamuka *et al.* (2005). Impact of a homestead gardening program on household food security and empowerment of women in Bangladesh. *Food Nutr Bul*. 26(1):17-25.

Food and Agriculture Organization. *The state of food insecurity in the world*.

Rome: FAO, 2004. [www.fao.org/documents/show_cdr.asp?](http://www.fao.org/documents/show_cdr.asp?url_file=/docrep/007/y5650e/y5650e00.htm)

[url_file=/docrep/007/y5650e/y5650e00.htm](http://www.fao.org/documents/show_cdr.asp?url_file=/docrep/007/y5650e/y5650e00.htm) (accessed 20 Sep 2005).